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# MOSFET – N-Channel, POWERTRENCH®

**30 V, 18.5 A, 4.5 mΩ**

## FDS8813NZ

### Description

This N-Channel MOSFET is Produced using onsemi’s Advanced POWERTRENCH Process that has been especially tailored to minimize the on-state resistance.

This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

### Features

- Max  $R_{DS(on)}$  = 4.5 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 18.5\text{ A}$
- Max  $R_{DS(on)}$  = 6.0 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 16\text{ A}$
- HBM ESD Protection Level of 5.6 kV Typical (note 3)
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- These Device is Pb-Free and RoHS Compliant

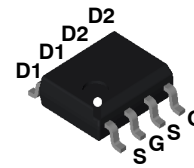
### MOSFET MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current–Continuous	18.5	A
	–Pulsed	74	
$E_{AS}$	Single Pulse Avalanche Energy (Note 4)	337	mJ
$P_D$	Power Dissipation (Note 1a)	2.5	W
	Power Dissipation (Note 1b)	1.0	
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range	–55 to +150	°C

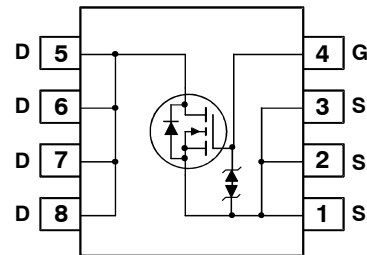
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

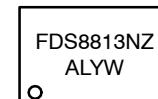
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	25	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	125	



SOIC8  
CASE 751EB



### MARKING DIAGRAM



FDS8813NZ = Specific Device Code  
A = Assembly Location  
L = Lot Traceability Code  
YW = Date Code (Year and Week)

### ORDERING INFORMATION

Device	Package	Shipping†
FDS8813NZ	SOIC–8 (Pb–Free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

# FDS8813NZ

## ELECTRICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0 \text{ V}$	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	20	–	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}$ , $V_{GS} = 0 \text{ V}$	–	–	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$	–	–	$\pm 10$	nA

### On Characteristics (Note 3)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250 \mu\text{A}$	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	–6	–	$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain to Source On-Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 18.5 \text{ A}$	–	3.8	4.5	m $\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 16 \text{ A}$	–	4.7	6.0	
		$V_{GS} = 10 \text{ V}$ , $I_D = 18.5 \text{ A}$ , $T_J = 125^\circ\text{C}$	–	5.1	6.6	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5 \text{ V}$ , $I_D = 18.5 \text{ A}$	–	74	–	S

### Dynamic Characteristics

$C_{ISS}$	Input Capacitance	$V_{DS} = 15 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	–	3115	4145	pF
$C_{OSS}$	Output Capacitance		–	580	775	pF
$C_{RSS}$	Reverse Transfer Capacitance		–	345	520	pF
$R_g$	Gate Resistance	$f = 1 \text{ MHz}$	0.1	1.8	5.6	$\Omega$

### Switching Characteristics (Note 3)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15 \text{ V}$ , $I_D = 18.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$	–	13	24	ns
$t_r$	Rise Time		–	8	16	ns
$t_{d(off)}$	Turn-Off Delay Time		–	39	63	ns
$t_f$	Fall Time		–	7	14	ns
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ , to $10 \text{ V}$ , $V_{DD} = 15 \text{ V}$ , $I_D = 18.5 \text{ A}$	–	55	76	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ , to $5 \text{ V}$ , $V_{DD} = 15 \text{ V}$ , $I_D = 18.5 \text{ A}$	–	28	40	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 15 \text{ V}$ , $I_D = 18.5 \text{ A}$	–	9	–	nC
$Q_{gd}$	Gate to Drain Charge "Miller" Charge		–	10	–	nC

### Drain-Source Diode Characteristics and Maximum Ratings

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$ , $I_S = 2.1 \text{ A}$ (Note 2)	–	0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 18.5 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$	–	32	47	ns
$Q_{rr}$	Reverse Recovery Charge		–	27	41	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

#### NOTES:

- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.



a)  $50^\circ\text{C}/\text{W}$  when mounted on a  $1 \text{ in}^2$  pad of 2 oz copper.



b)  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

- Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- The Diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.
- Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3 \text{ mH}$ ,  $I_{AS} = 15 \text{ A}$ ,  $V_{DD} = 30 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ .

TYPICAL CHARACTERISTICS

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

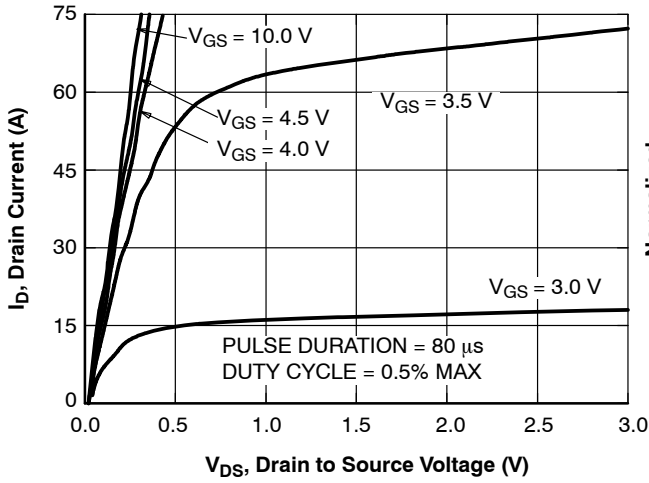


Figure 1. On-Region Characteristics

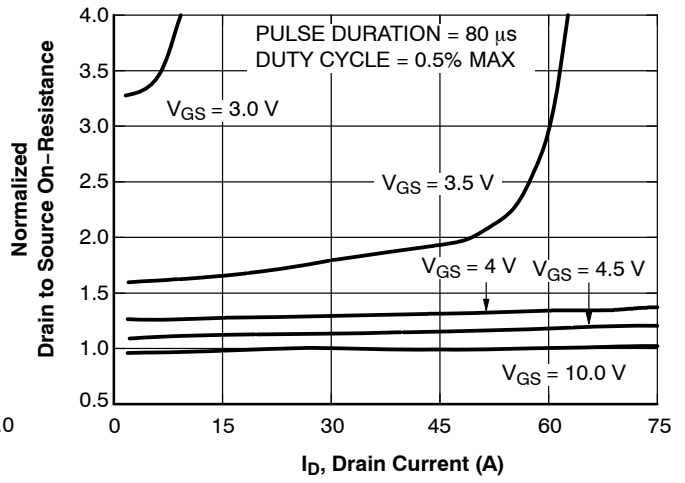


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

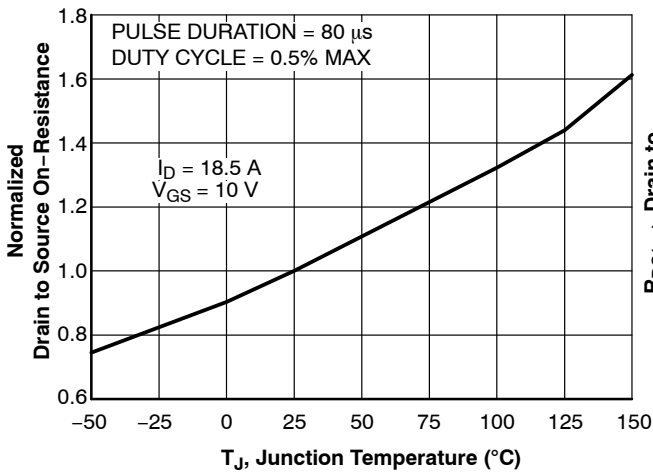


Figure 3. Normalized On-Resistance vs Junction Temperature

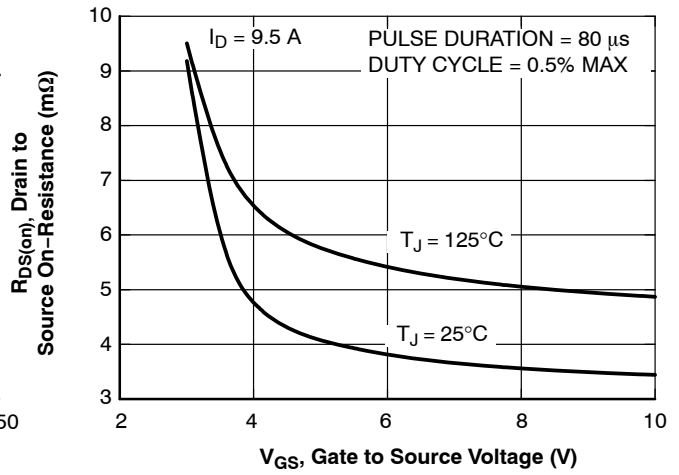


Figure 4. On-Resistance vs Gate to Source Voltage

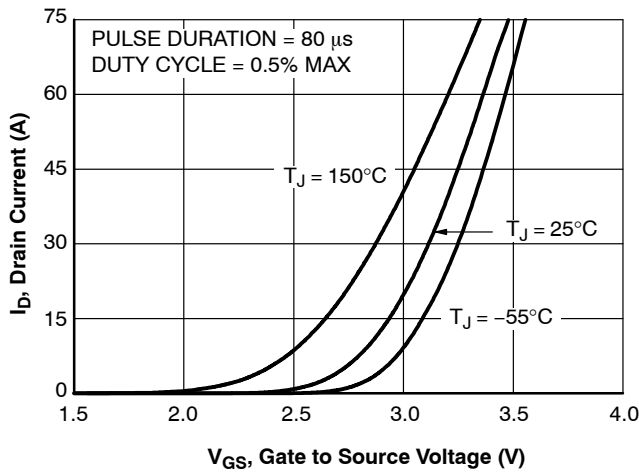


Figure 5. Transfer Characteristics

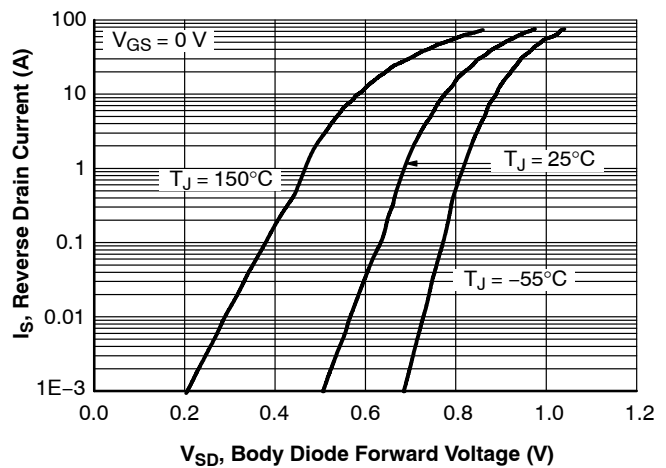


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (CONTINUED)

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

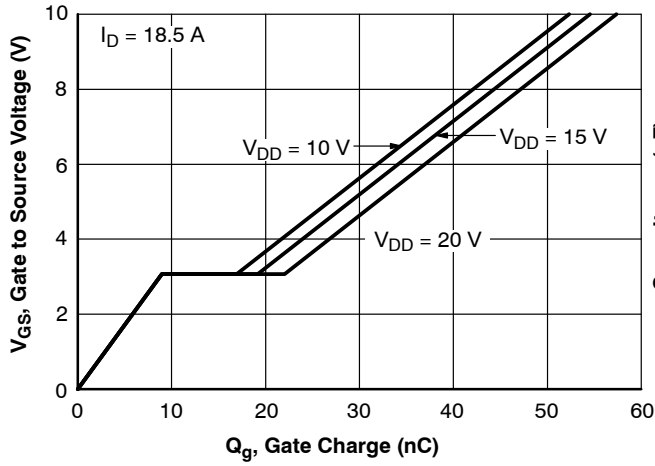


Figure 7. Gate Charge Characteristics

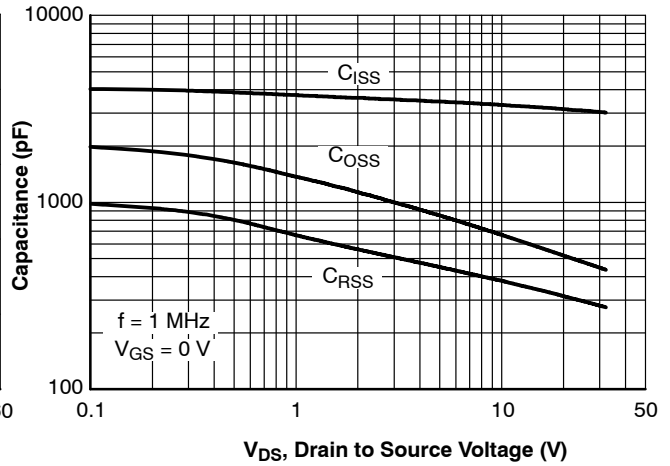


Figure 8. Capacitance vs Drain to Source Voltage

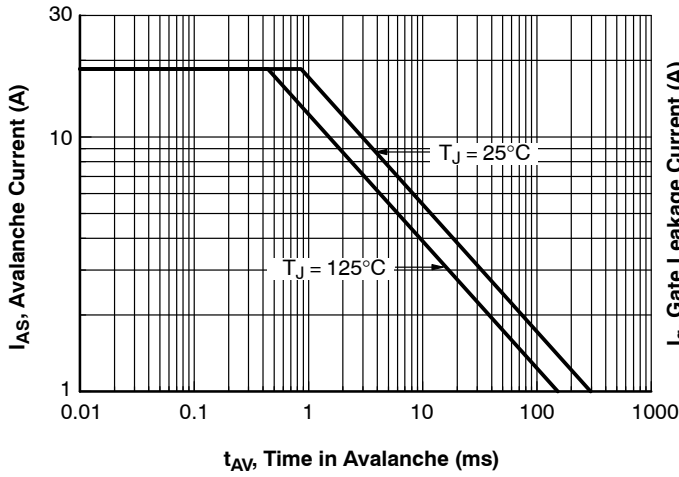


Figure 9. Unclamped Inductive Switching Capability

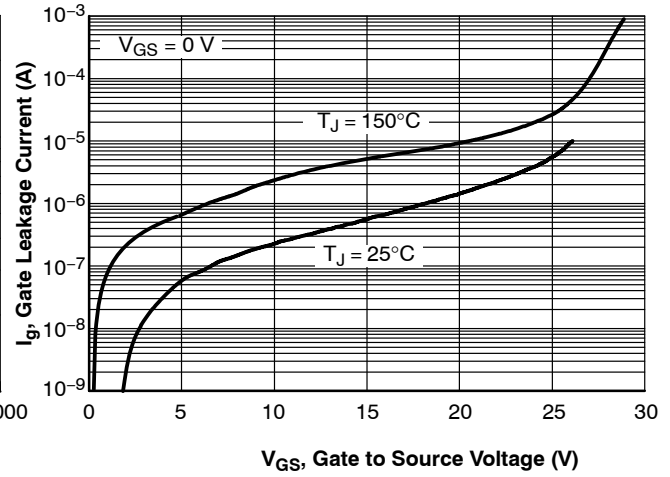


Figure 10. Gate Leakage Current vs Gate to Source Voltage

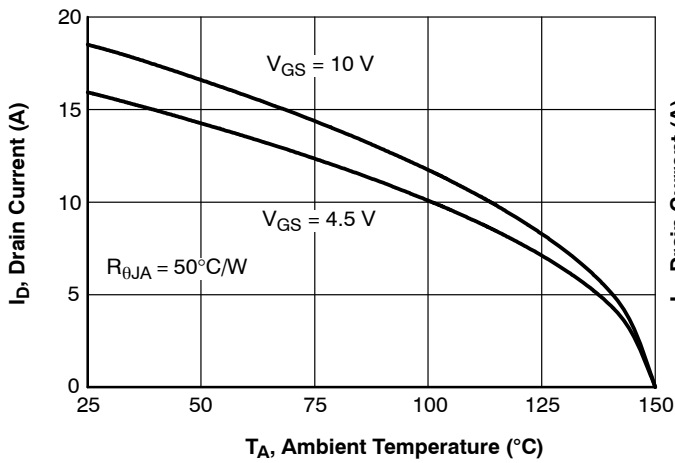


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

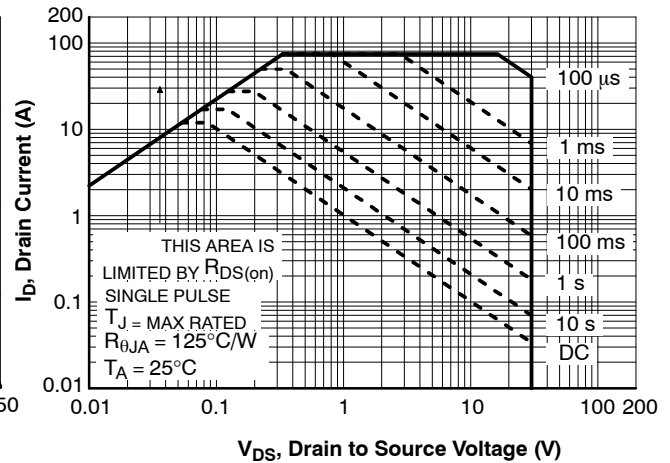


Figure 12. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS (CONTINUED)

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

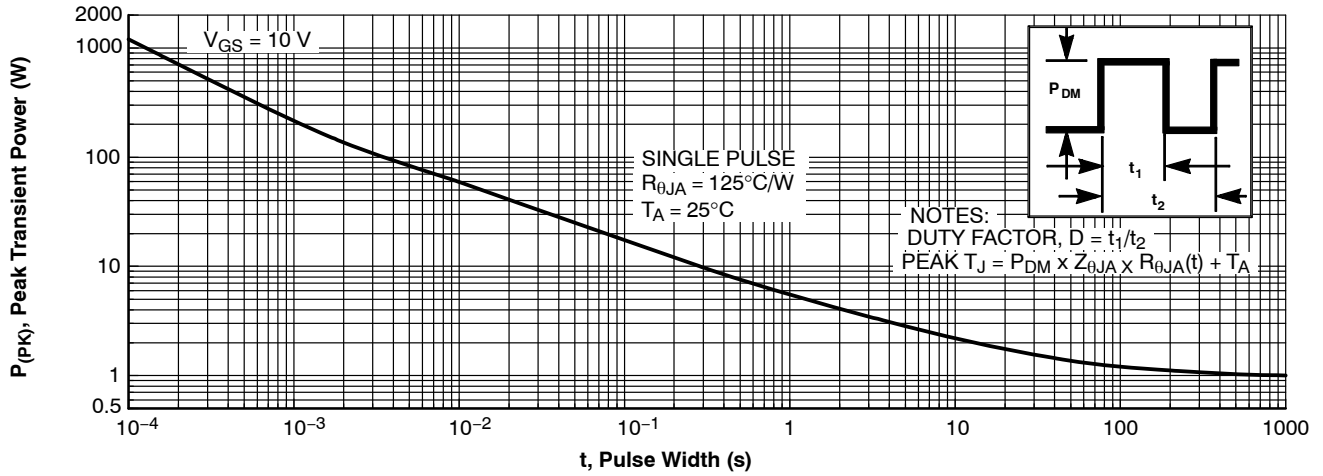


Figure 13. Single Pulse Maximum Power Dissipation

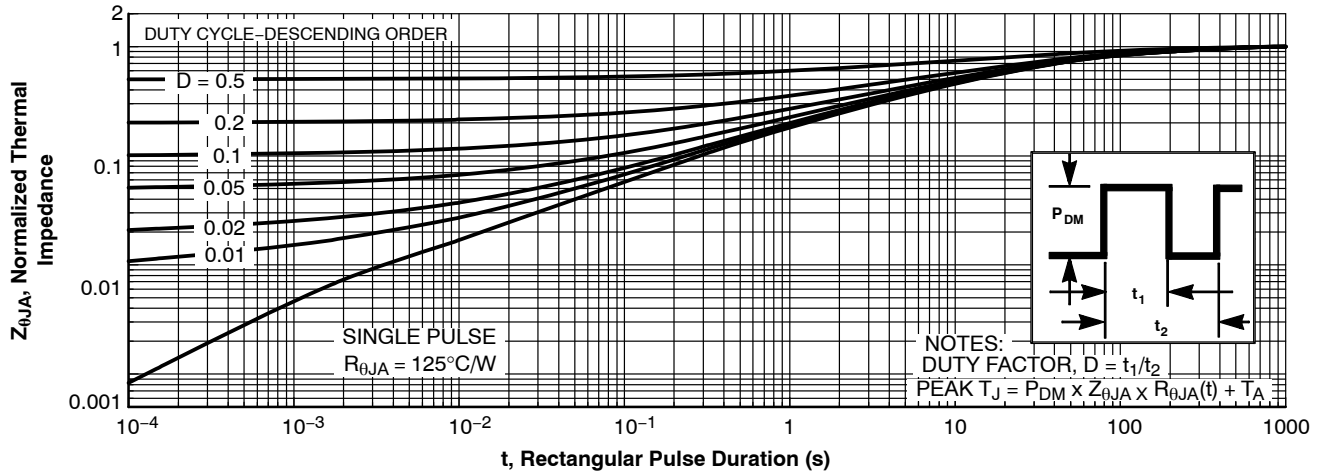


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

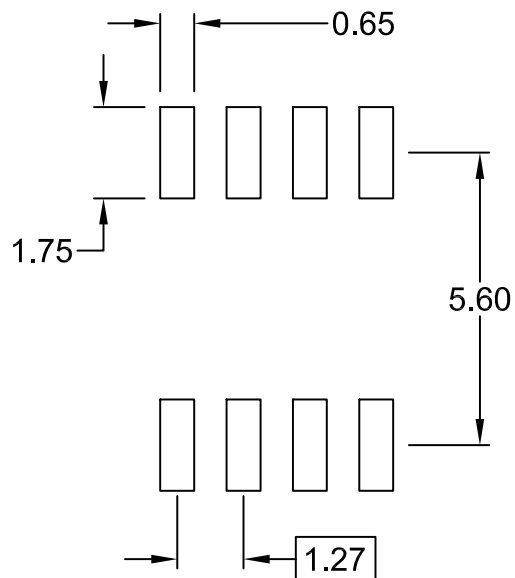
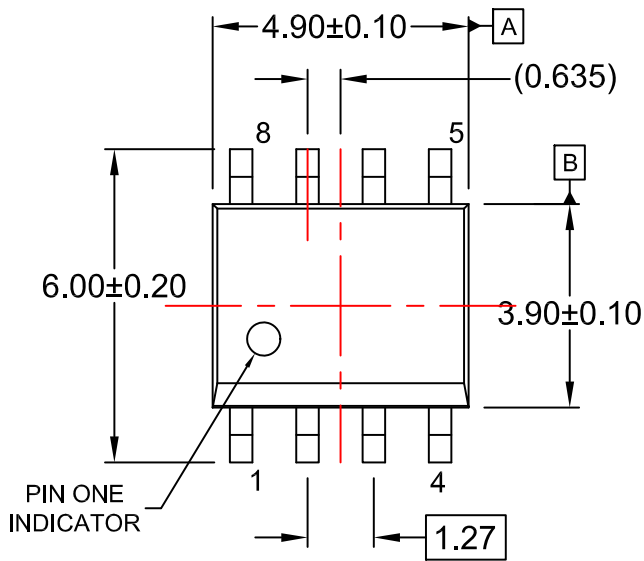
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®

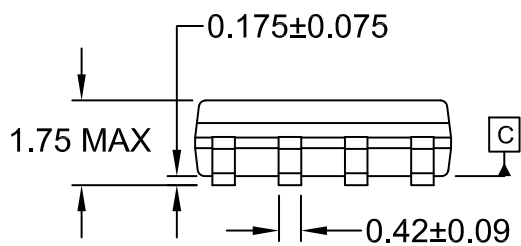


**SOIC8**  
**CASE 751EB**  
**ISSUE A**

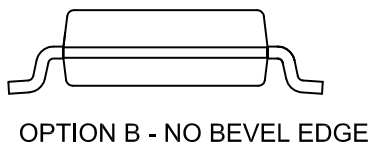
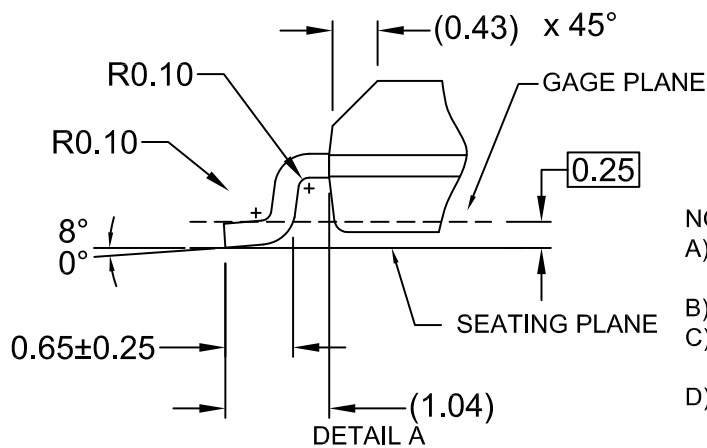
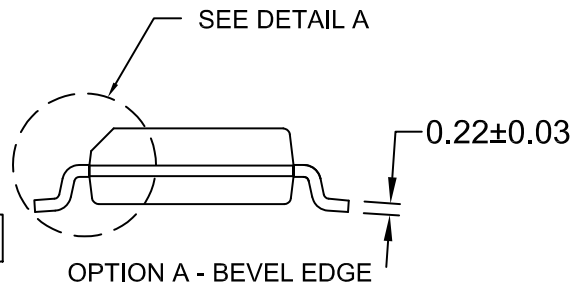
DATE 24 AUG 2017



⊕ 0.25 (M) C B A



⌒ 0.10



**NOTES:**

- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M

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